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RELIABILITY THEORY AND STOCHASTIC PROCESSES. SUMMARY OF WORK AC--ETC(U)
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RELIABILITY THEORY AND STOCHASTIC PROCESSES:

Summary of Work Accomplished

✓ Douglas R. Miller
Department of Statistics
University of Missouri
Columbia, Missouri 65201

28 September 1977

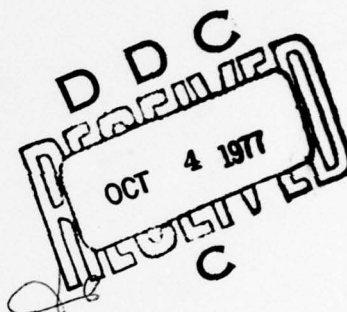
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RELIABILITY THEORY AND STOCHASTIC PROCESSES:

Summary of Work Accomplished

by

Douglas R. Miller
Statistics Department
University of Missouri
Columbia, Missouri 65201

September 28, 1977

The research proposal "Reliability Theory and Stochastic Processes" submitted on October 23, 1975 to the Office of Naval Research listed three general work areas:

1. Confidence regions for various functions.
2. Box-Jenkins models for failure-rate processes.
3. Maintenance of repairable systems.

The proposed areas are general. There was no intention of possibility of exhausting these work areas in one year. This document outlines the tasks accomplished during the period May 1, 1976 through June 30, 1977 with ONR support.

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TASKS ACCOMPLISHED

1. Confidence Regions and Related Topics:

A paper was prepared on the subject of modified Kolmogorov-Smirnov Statistics (1); this is currently not ready for publication, however.

It was determined that the approach to accelerated life testing outlined in the proposal was not realistic from an applied point of view.

No progress was made toward general theory and techniques for analytic determination of the distributions of suprema of certain Gaussian processes and functionals of Gaussian processes.

2. Box-Jenkins Models:

I worked with Nozer D. Singpurwalla, Department of Operations Research, The George Washington University, on this topic. We showed that Box-Jenkins models do not arise as limits under certain assumptions; but, we did come up with an approach to finding confidence regions for the failure-rate function (2).

3. Repairable Systems:

I obtained some results for the distribution of time until first system failure of a repairable system (3). With the idea of getting bounds on quantities of interest in this area, I did some work on stochastic inequalities: one paper on some specific processes (4) and one on a more general aspect of the theory (5).

4. Polymer Science:

This was not part of the proposed research; however, when I told ONR about my interest in the subject, we discovered it to be a common interest. The goal is to find probabilistic models which will predict or describe physical properties and behavior of polymeric materials. It is joint work with C. W. Macosko, Department of Chemical Engineering, University of Minnesota. We wrote a paper (6) on the effect of unequal reactivity, with ONR support. This extends our earlier work (7,8).

REFERENCES

Papers prepared with ONR support:

- (1) Modified Kalmogorov-Smirnov tests which are sensitive to tail behavior, Technical Report No. 65, Statistics Department, University of Missouri-Columbia.
- (2) Failure-rate estimation using random smoothing (with N. D. Singpurwalla), Technical Report No. 67, Statistics Department, University of Missouri-Columbia. (Submitted to Annals of Statistics.)
- (3) A continuity theorem and some counterexamples for the theory of maintained systems, Technical Report No. 66, Statistics Department, University of Missouri-Columbia. (To appear in Stochastic Processes and their Applications.)
- (4) Almost sure comparisons of renewal processes and Poisson processes, with application to reliability theory, Technical Report No. 63, Statistics Department, University of Missouri-Columbia. (Tentatively accepted by Mathematics of Operations Research.)
- (5) The existence of almost surely comparable versions of stochastically comparable random vectors and functions, Technical Report No. 64, Statistics Department, University of Missouri-Columbia.
- (6) Average property relations for nonlinear polymerization with unequal reactivity (with C. W. Macosko), submitted to Macromolecules.

Other papers:

- (7) A new derivation of average molecular weights of nonlinear polymers (with C. W. Macosko), Macromolecules 9 (1976), 199-206.
- (8) A new derivation of post gel properties of network polymers (with C. W. Macosko), Macromolecules 9 (1976), 206-211.

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Work related to reliability theory and stochastic processes accomplished under this ONR contract is summarized with reference given to technical reports prepared.		

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